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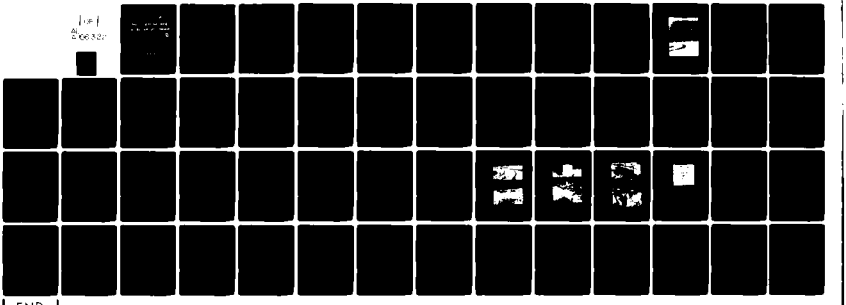

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POTOMAC RIVER BASIN

Name Of Dam: PRECISION DYNAMICS LAKE DAM

Location: LOUDOUN COUNTY, VIRGINIA

Inventory Number: VA. NO. 10711

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

BY

SCHNABEL ENGINEERING ASSOCIATES, P.C./
J. K. TIMMONS AND ASSOCIATES, INC.

MAY 1981

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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POTOMAC RIVER BASIN

NAME OF DAM: PRECISION DYNAMICS LAKE DAM
LOCATION: LOUDOUN COUNTY, VIRGINIA
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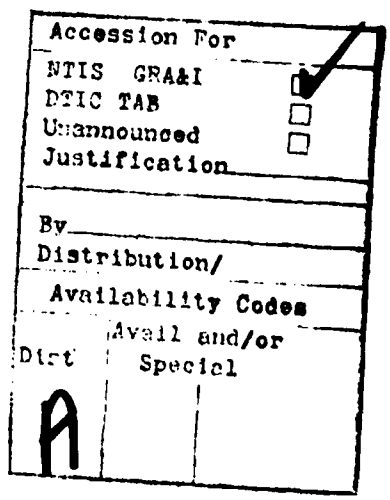

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Precision Dynamics Lake Dam
State:	Virginia
Location:	Loudoun County
USGS Quad Sheet:	Bluemont
Coordinates:	Lat 39° 06.7' Long 77° 45.9'
Stream:	Tributory of North Fork of Goose Creek
Date of Inspection:	May 4, 1981

Precision Dynamics Lake Dam is a homogeneous earthfill structure about 400 ft long and 36 ft high. The principal spillway consists of a 48 inch diameter corrugated metal pipe (CMP) riser and a 36 inch diameter CMP outlet which extends through the structure. An earth emergency spillway is located at the right abutment with an 80 ft wide bottom and 3H:1V side slopes. The structure is classified small in size and is assigned a significant hazard classification. The dam is located on a tributary of the North Fork of Goose Creek approximately 1½ miles south of Round Hill, Virginia. The lake is used for irrigation and recreational purposes and is owned and maintained by the Bankers Life and Casualty Company.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the appropriate Spillway Design Flood (SDF) is the ½ PMF. The spillway will pass 80 percent of the Probable Maximum Flood (PMF) or 160 percent of the SDF without overtopping the dam. The spillway is rated adequate.

The visual inspection revealed no apparent problems. An evaluation of the stability condition could not be made since there is insufficient design and construction data for this structure. The downstream embankment slope and crest meet U. S. Bureau of Reclamation requirements, however, the upstream slope is slightly steeper than recommended for the rapid drawdown condition. Based on the design and construction of the dam and the performance history of the structure, this is not considered a serious problem and a stability check is not required.

It is recommended that the owner implement an emergency action plan to warn the downstream dwelling of any dangers which may be imminent.

The following routine maintenance and observation functions should be initiated within the next twelve months:

Existing trees and brush on the dam should be cut to the ground. Animal burrows in the embankment should be backfilled. Sloughing observed on the upstream slope in line with the intake structure should be corrected and reseeded. The plunge pool should be protected against further erosion by lining with riprap.

Iron stained seepage areas present below the embankment on the left side of the discharge channel should be monitored quarterly to detect any flow which may cause piping within the embankment. A staff gage should be installed to monitor water levels.

Prepared by:

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J. K. TIMMONS & ASSOCIATES, INC.

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Submitted by:

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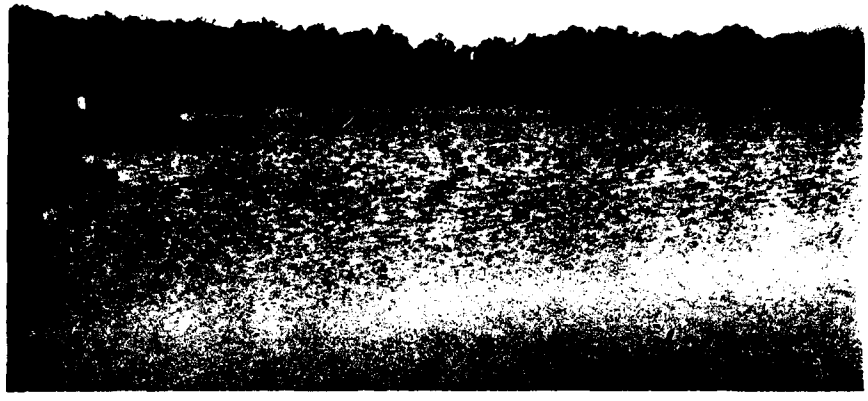
Jack G. Starr
Chief, Engineering Division

Date: SEP 2 1981



Precision Dynamics Lake

Dam

Overview Photographs

SECTION 1 - PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspection of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (see Reference 1, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Precision Dynamics Lake Dam is a homogeneous earthfill structure approximately 400 ft long and 36 ft high.* The crest of the dam is 20 ft wide, and side slopes are approximately 2.5 horizontal to 1 vertical (2.5H:1V) on the downstream slope and 3H:1V on the upstream slope of the dam. The crest of the dam is at elevation 543 msl. Design drawings indicate the embankment includes a core trench. Although not illustrated in the design drawing, an internal drainage system was included. There is riprap protection on the upstream slope.

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* Height is measured from the top of the dam to the downstream toe at the centerline of stream.

The principal spillway consists of a 48 inch diameter CMP riser inlet. The riser is connected to a 36 inch diameter CMP outlet which runs through the dam. The riser crest is at elevation 535 msl. A 24 inch diameter sluice gate in the riser at an invert elevation of 508± msl is used to drain the lake. The outlet pipe has a length of approximately 122 ft with an invert elevation at the outlet structure of 507± msl (see Field Sketch 1, Appendix III).

The emergency spillway consists of a vegetated earthen channel located on the right abutment, with a crest elevation of 538 msl. The spillway has a bottom width of 80 ft. 3H:1V side slopes. and is in a cut section (see Field Sketch 2, Appendix III).

1.2.2 Location: The dam is located on a tributory of the North Fork of Goose Creek approximately 1.5 miles south of Round Hill, Virginia (see Plate No. 1, Appendix I)

1.2.3 Size Classification: The dam is classified as a small size structure based on its height and maximum lake storage potential as defined in Reference 1, Appendix IV.

1.2.4 Hazard Classification: The dam is located in a rural area; however, based upon the proximity of Sleeter Lake located ¼ mile downstream and the presence of one dwelling ¼ mile± below Sleeter Lake Dam, the dam is assigned a "significant" hazard classification. The hazard classification used to categorize a dam is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The dam is owned and maintained by the Bankers Life and Casualty Company, 4444 Lawrence Avenue, Chicago, Illinois 60630.

1.2.6 Purpose: Recreation and irrigation.

1.2.7 Design and Construction History: The dam was designed by the U. S. Department of Agriculture, Soil Conservation Service (SCS) and

constructed by L. B. Mason of Hamilton, Virginia. The dam was completed in 1967.

1.2.8 Normal Operational Procedures: The principal spillway is ungated, therefore, water rising above the crest of the riser inlet is automatically discharged downstream. Normal pool is maintained at elevation 535 msl at the crest of the riser. Flood discharges which cannot be absorbed by storage and the riser, flow through the emergency spillway at pool elevations about 538 msl. The 24 inch diameter gate at elevation 508 is manually operated and is used to lower the lake elevation below normal pool for maintenance purposes.

1.3 Pertinent Data:

1.3.1 Drainage Area: The drainage area is 0.78 square miles.

1.3.2 Discharge at Dam Site: The flood of record according to Mr. John Sleeter (son of previous owner) occurred in the spring of 1977, however, the pool elevation was not observed.

Principal Spillway Discharge:

Pool Elevation at Crest of Dam (elev 543)	154 CFS

Emergency Spillway Discharge:

Pool Elevation at Crest of Dam (elev 543)	3150 CFS

1.3.3 Dam and Reservoir Data: See Table 1.1, below:

Table 1.1 - DAM AND RESERVOIR DATA

	Reservoir				
			Storage		
	Elevation feet msl	Area Acres	Volume Acre Feet	Watershed Inches	Length Miles
Crest of Dam	543	27	391	9.4	.5
Emergency Spillway Crest	538	19	263	6.4	.4
Principal Spillway Crest	535	17	204	4.9	.4
Streambed at Downstream Toe of Dam	507	-	-	-	-

SECTION 2 - ENGINEERING DATA

2.1 Design: The dam was designed and constructed under the direction of the USDA, Soil Conservation Service (SCS). Design data are available from the Loudoun County SCS Field Office in Leesburg, Virginia.

The dam was designed as a homogeneous, compacted earthfill embankment with side slopes of 2.5H:1V. A core trench was planned beneath the embankment, having a bottom width of 12 ft and 1H:1V side slopes. Although not shown in the design drawing, (Plate 2, Appendix I) the dam includes a toe drain consisting of 6 inch bituminous coated corregated metal pipe (CMP) enclosed in a stone envelope. Two 6 inch toe drain outlet pipes exist on either side of the principal spillway outlet.

The principal spillway was designed as a drop inlet structure consisting of a CMP riser, a 36 inch CMP conduit and a stilling basin or plunge pool at the outlet end of the conduit. Three bituminous coated corregated metal anti-seep collars were installed around the principal spillway pipe in order to control any potential piping problems along the spillway pipe. Details of the principal spillway and riser are shown on Field Sketch 1 of Appendix III and Plate 2, Appendix I.

The emergency spillway is designed as a trapezoidal vegetated earth channel cut into natural ground with 3H:1V side slopes.

2.2 Construction: The dam was constructed by L. B. Mason of Hamilton, Virginia and completed in 1967. There were no construction records available for this structure. According to Mr. J. Allen Gulick (SCS) the embankment was constructed with soils excavated from the reservoir and the emergency spillway. He described the dam as consisting of 60 to 70% plastic materials of the Worsham soil series while the remainder of the embankment was constructed with granular Dubanks-Chester soils. The

fill was placed in lifts not exceeding 12 inches in thickness and compacted with a sheepsfoot roller. Although no field density tests were taken, construction was observed intermittently by SCS personnel. The core trench excavation was terminated on "hard rock" and the maximum depth of excavation was approximately 15 ft.

2.3 Evaluation: The design drawing is generally representative of the structure with the following exceptions: the toe drain was not shown in design. Also, a crest width of 16 ft and upstream slope of 2.5H:1V are shown in design; however, a 20 ft crest width and 3H:1V upstream slope were measured during the inspection.

Hydrologic and hydraulic calculations were not available for evaluation. There is insufficient information to evaluate foundation conditions and embankment stability.

SECTION 3 - VISUAL INSPECTION

3.1 Findings: At the time of inspection, the dam was in good condition. Field observations are outlined in Appendix III.

3.1.1 General: An inspection was made on May 4, 1981. The weather was clear, the temperature was about 75°F, and the ground conditions were dry. The pool and tailwater levels at the time of inspection were 535 and 507 msl, respectively. This corresponds to normal pool and tailwater elevations. No previous inspection reports were available.

3.1.2 Dam and Spillway: The embankment slopes and emergency spillway were grassed and well maintained. A gravel road occupies the crest of the dam and extends across the emergency spillway. Two small trees and one large brier bush exist on the left side of the downstream slope.

Some sloughing was noted on the upstream slope in line with the intake structure. The only erosion observed was in the form of cattle paths traversing both the upstream and downstream slopes. Several animal burrows were encountered across the embankment.

Along the left downstream toe the ground is saturated and includes scattered marsh grass. This area extends to a point 8 ft above the discharge pool along the left abutment/embankment contact. Scattered iron staining and the presence of films on some ponded areas were noted, however, no flow was observed. Some iron staining was also encountered 100 ft$^{+}_{-}$ below the discharge pipe along the stream channel. A $^{+}_{-}$ 200 ft long saturated, marshy area occurs along the right side of the stream approximately 135 ft below the dam (Field Sketch 3, Appendix III).

The riser and outlet pipe indicated no signs of deterioration and were functioning properly at the time of inspection. The plunge pool was void

of riprap and indicated some erosion. Riprap present on the upstream slope appeared to be functioning properly and in good condition.

3.1.3 Reservoir Area: The reservoir area was free of debris and the perimeter was pasture. The reservoir is located in a valley with gentle side slopes.

3.1.4 Downstream Area: The downstream channel consists of a 4 ft wide channel located in a valley with gentle side slopes. This valley is pasture land except for some tree growth along the stream channel. Approximately ¼ mile downstream, the stream empties into Sleeter Lake, and several homes exist ¼ to 4 miles below Sleeter Lake.

3.1.5 Instrumentation: No instrumentation (monuments, observation wells, piezometers, etc.) was encountered for the structure. There is no staff gage.

3.2 Evaluation:

3.2.1 Dam and Spillways: Overall, the dam appeared to be well maintained and was in good condition at the time of inspection. The presence of trees on the embankment may promote the development of deep rooted vegetation and this type growth can encourage piping within an embankment. It is recommended that the two small trees and large brier bush be cut to the ground.

The cattle paths are not considered detrimental to the proper performance of the dam. Riprap should be placed around the plunge pool to reduce erosion during periods of flooding. The animal burrows do not presently create an unsafe condition; however, future burrowing could result in numerous voids in the embankment which could be potentially hazardous under certain conditions. It is recommended that existing burrows be backfilled. Sloughing observed on the upstream slope in line with the intake structure should be corrected and reseeded.

The saturated marshy area located 135 ft^{+} below the right downstream toe is believed to be related to spring activity and does not require any special attention. The saturated marshy area and iron staining observed below the left downstream toe is believed to be related to seepage through the dam, but could possibly be related to spring activity. This area does not present a hindrance to the normal functioning of the dam, however, it is recommended it be monitored quarterly to detect flow which may cause piping in the embankment. If increased flow should occur, a Professional Engineer with expertise in Geotechnical Engineering should be contacted to evaluate the problem and make recommendations for required corrective measures.

The outlet pipe and intake structure are in good structural condition. A staff gage should be installed to monitor water levels.

3.2.2 Downstream Area: A breach in the Precision Dynamics Lake Dam during extreme flooding would possibly create a hazard to the downstream dam (Sleeter Lake) resulting in a hazard to the dwellings downstream of Sleeter Lake.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool is elevation 535.1 msl or 0.1 ft above the crest of the CMP principal spillway inlet. The lake provides irrigation supply and recreation. Water automatically passes through the principal spillway as the water level in the reservoir rises above the principal spillway crest. Water will also pass automatically through the emergency spillway when the water level in the reservoir reaches elevation 538 msl. A 24 inch slide gate valve at the low point in the riser structure is provided to drawdown the reservoir below normal pool.

4.2 Maintenance of Dam and Appurtenances: Maintenance is the responsibility of the owner. Maintenance consists of inspection, debris removal, mowing of vegetative cover and repair.

4.3 Warning System: At the present time, there is no warning system or evacuation plan for the dam.

4.4 Evaluation: The dam and appurtenances are in good operating condition, and maintenance of the dam appeared to be adequate. Documentation of and a routine maintenance program should be developed for this structure. An emergency operation and warning plan should be developed. It is recommended that a formal emergency procedure be prepared and furnished to all operating personnel. This should include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area is necessary.

SECTION 5 - HYDRAULICS/HYDROLOGIC DATA

5.1 Design: Precision Dynamics Lake Dam was designed by the Soil Conservation Service (SCS) as a multi-purpose dam; however, hydrologic and hydraulic data are not available.

5.2 Hydrologic Records: There are no records available.

5.3 Flood Experience: According to Mr. John Sleeter (son of the former owner) the flood of record occurred in the Spring of 1977; however, the pool elevation was not observed.

5.4 Flood Potentials: In accordance with the established guidelines, the Spillway Design Flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meterologic and hydrologic conditions that are reasonably possible in the region), or fractions thereof. The Probable Maximum Flood (PMF) and ½ PMF and 100 year flood hydrographs were developed by the HEC-1 method (Reference 5, Appendix IV). Precipitation amounts for the flood hydrograph of the PMF and 100 year flood were taken from U. S. Weather Bureau Information (Reference 6 and 7, Appendix IV). Appropriate adjustments for basin size and shape were accounted for. These hydrographs were routed through the reservoir to determine maximum pool elevation.

5.5 Reservoir Regulations: For routing purposes, the pool at the beginning of flood was assumed to be at elevation 535 msl. Reservoir stage-storage data and stage-discharge data were computed from field sketches and available topographic data. Floods were routed through the reservoir using the principal spillway discharge up to a pool storage elevation of 538 msl and a combined principal and emergency discharges for pool elevations above 538 msl. Pool elevations above 543 msl were routed

over the non-overflow section of the dam.

5.6 Overtopping Potential: The predicted rise of the reservoir pool and other pertinent data were determined by routing the flood hydrographs through the reservoir as previously described. The results for the flood conditions (100 year flood, ½ PMF and PMF) are shown in the following Table 5.1:

TABLE 5.1 - RESERVOIR PERFORMANCE

		Hydrograph		
	Normal Flow	100 Year Flood	½ PMF	PMF
Peak Flow, CFS				
Inflow	1	925	2277	4555
Outflow	1	507	2108	4017
Maximum Pool Elevation Ft, msl	535	539.4	541.6	543.4
Non-Overflow Section (Elev 543 msl)				
Depth of Flow, Ft	-	-	-	.4
Duration, Hours	-	-	-	1.0
Velocity, fps*	-	-	-	2.7
Tailwater Elevation Ft, msl	507	511	512.5	513.5

*Critical velocity

5.7 Reservoir Emptying Potential: A 24 inch diameter gate at elevation 508$^{+}_{-}$ msl is capable of draining the reservoir through the outlet pipe. Assuming that the lake is at normal pool elevation (535 msl) and there is 1 cfs inflow, it would take approximately 2 days to lower the reservoir to elevation 508$^{+}_{-}$ msl. This is equivalent to an approximate drawdown rate of 13.5 ft/day based on the hydraulic height measured from normal pool to the invert of the drawdown pipe divided by the time to dewater the reservoir.

5.8 Evaluation: The U. S. Army, Corps of Engineers' guidelines indicate the appropriate Spillway Design Flood (SDF) for a small size, significant hazard dam is the 100 year to ½ PMF. Because of the risk involved, the ½ PMF has been selected as the SDF. The spillway will pass 80 percent of the PMF without overtopping the crest of the dam (160 percent of the SDF).

Hydrologic data used in the evaluation pertains to present day conditions with no consideration given to future development.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: The dam is located along the eastern edge of the Blue Ridge physiographic province of Virginia. The impoundment and structure are underlain by the Marshall Formation of Precambrian Age. The Marshall has many variations in texture and structure, but its general composition appears to be approximately that of granodiorite and is gneissic in structure. Local lineation strikes to the northeast and dips approximately 60° to the southeast. A northward trending normal fault has been mapped approximately 2000 ft east of the dam. According to the Loudoun County Soils Report (Reference 4, Appendix IV) granodiorite bedrock generally occurs at depths of 2 to 20 ft below the existing ground surface near the dam. Bedrock is overlain by residual soils derived from the in place weathering of the bedrock. Surface soils exposed in the stream channel are alluvial in origin.

The potential for seepage within the foundation was apparently recognized by the designer, since design drawings indicate the presence of a cutoff trench. According to SCS personnel the cutoff was undercut down to "hard rock" which could not be excavated with a front end loader. The bottom of the trench is 12 ft wide and has side slopes of 1H:1V. Design details are shown on Plate 2, Appendix I.

Gradual consolidation of underlying soils would be expected during application of fill materials. The underlying soils probably had essentially fully consolidated under the applied load not long after completion of construction. Based upon the performance history of this dam and the materials present, a stable foundation is assumed.

6.2 Embankment:

6.2.1 Materials: Design drawings show the dam as a homogeneous

[illegible] the design data, however, according to SCS personnel, the fill was constructed with approximately 60 - 70% plastic material to conform to the Worsham series (alluvial) and the remainder with granular materials of the Enbanks-Chester series (residual). Worsham soils consist primarily of silty clay loam (CL to MH) clay loam (CH) and sandy clay loam (SC) materials while the Enbanks-Chester soils consist basically of loam and sandy to silty loams ranging from ML, CL to SM in accordance with the Unified Soil Classification. The fill was placed in 12 inch lifts and compacted with a sheepsfoot roller. Field density tests were not performed to verify the percent compaction. Fill placement was observed only intermittently by SCS personnel during periodic inspection visits.

6.2.2 Subdrains and Seepage: Although not shown in design, according to SCS personnel, an internal drainage system was constructed for this structure. It consists of 324 ft of 6 inch perforated bituminous coated corrugated metal pipe (bccmp) extending beneath the structure to both abutments. The toe drain is enclosed in a stone envelope and drains into the plunge pool, exiting from two 6 inch bccmp located on either side of the principal spillway outlet. At the time of the inspection clear flow was observed from both outlets. Flows were estimated as 3 and 5 gpm from the right and left outlets, respectively.

Two marshy saturated areas were encountered below the dam on the right and left sides of the stream channel. According to SCS personnel, these areas existed prior to construction of the dam and are related to spring activity. Scattered iron staining observed in the left marsh is believed to be related to seepage through the dam.

...3 Stability: A stability analysis was not performed for this structure; however, we understand the embankment slopes were designed in accordance with SCS guidelines. The dam is 36 ft high and has a crest width of 20 ft. Side slopes are approximately 3H:1V on the upstream slope and 2.5H:1V on the downstream slope of the dam.

The dam was designed as a homogeneous earth embankment and constructed with soils generally ranging from SC to CL in Unified Classification. The stability is assessed assuming a homogeneous dam. The dam is subjected to rapid drawdown because the approximate reservoir drawdown rate of 13.5 ft per day exceeds the critical rate of 0.5 ft per day for earth dams. According to guidelines presented in Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation for small homogeneous dams, with stable foundation, subjected to a drawdown and with embankment composed of SC to CL materials, the recommended slopes are 3H:1V to 3.5H:1V upstream and 2H:1V to 2.5H:1V downstream. The recommended crest width is 17.2 ft. Based upon these general guidelines the embankment crest and downstream slope are adequate, but the 3H:1V upstream slope is slightly steeper than that recommended, assuming that 70 percent of the dam is constructed with CL materials.

...4 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: An accurate check on the stability of this structure cannot be made since there was no stability analysis and laboratory test data available. The downstream embankment slope and the embankment crest width both meet or slightly exceed the requirements recommended by the U. S. Bureau of Reclamation. The upstream slope is slightly steeper than recommended when subject to rapid drawdown. The existing upstream slope is 3H:1V while a 3.5H:1V slope is recommended for CL materials subjected to the rapid drawdown condition. It was reported that approximately 60 to 70 percent of the embankment was constructed with plastic materials, however, we understand the remainder of the dam was constructed with SC to SM materials which were placed on the outer portion of the dam. This agrees with the soils generally observed in the embankment during the inspection. According to the SCS description of the embankment, this structure may in fact be considered a zoned dam as constructed and thus a 3H:1V upstream slope would agree with the rapid drawdown requirements.

Based upon the visual inspection, the design data, and construction and performance history of this structure the foundation is considered stable and a stability analysis is not required.

Overtopping is not considered a problem because the spillway will pass 160 percent of the SDF. Since no undue settlement, cracking, or seepage was noted at the time of inspection, it appears that the embankment is adequate for control storage at elevation 535 msl.

The marshy saturated areas located below the downstream slope on the left and right sides of the discharge channel are believed to be related to spring activity. Iron stained areas observed on the left side may be related to seepage through the dam near the left downstream abutment-

embankment contact. This does not necessarily create an unsafe condition; however, these iron stained areas should be monitored periodically in attempt to detect any significant increases in flow which may result in piping within the embankment.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: Sufficient engineering data is available for assessing the dam except for stability. The visual inspection revealed no findings that proved the dam to be unsound. A routine maintenance program does exist: however, there is no emergency operation and warning plan. Overall, the dam was in good condition at the time of inspection. U. S. Army, Corps of Engineers guidelines indicate the appropriate Spillway Design Flood (SDF) for this dam is the ½ PMF. The spillway is judged adequate.

The actual embankment structure appears to be similar to the design drawings with the exception of a 3H:1V upstream slope measured as compared to 2.5H:1V in design. Also, the embankment crest is 4 ft wider than shown in design. The embankment crest and downstream slope meet the requirements recommended by the U. S. Bureau of Reclamation (Reference 2, Appendix IV). The upstream slope is slightly steeper than recommended when subject to rapid drawdown. Since the structure was designed in accordance with SCS standards, properly constructed, and has a good performance record, the slightly steeper slope is not considered a serious problem and, therefore, no additional studies are recommended.

7.2 Recommended Remedial Measures:

7.2.1 Emergency Operation and Warning Plan: It is recommended that a formal emergency procedure be prepared, prominently displayed, and furnished to all operating personnel. This should include:

1) How to operate the dam during an emergency
2) Who to notify, including public officials, in case evacuation from the downstream is necessary.

7.3 Required Maintenance and Observation: It is recommended that a regular maintenance operation program be established and documented for future reference if one does not already exist. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintenance period within the next 12 months:

7.3.1 Existing trees and brush on the dam should be cut to the ground.

7.3.2 Animal burrowing in the embankment should be backfilled.

7.3.3 Sloughing observed on the upstream slope in line with the intake structure should be corrected and reseeded.

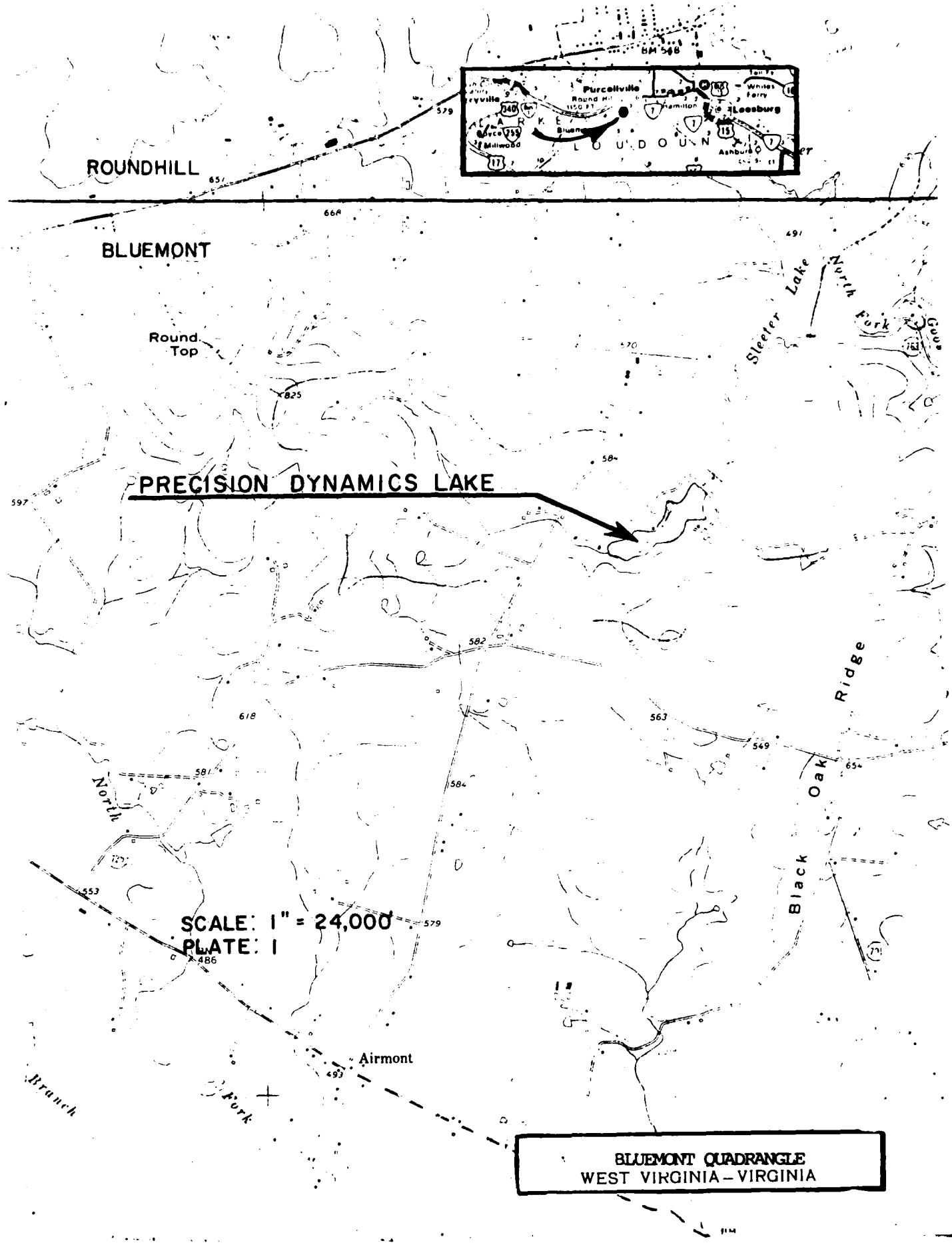
7.3.4 The plunge pool area should be protected against further erosion by lining with riprap or utilizing some other effective measure.

7.3.5 Iron stained seepage present in the marshy area below the left downstream abutment-embankment contact should be monitored quarterly to detect any increase which may cause piping within the embankment.

7.3.6 A staff gage should be installed to monitor water levels.

APPENDIX I

MAPS AND DRAWINGS


ROUNDHILL
BLUEMONT
Round Top
PRECISION DYNAMICS LAKE
Sleeter Lake
North Fork
Black Oak Ridge
North
Branch
Airmont
Purcellville
Leesburg
Ashburn
LOUDOUN
SCALE: 1" = 24,000
PLATE: 1
BLUEMONT QUADRANGLE
WEST VIRGINIA – VIRGINIA

SCS-no. 102 (Rev)
1-12-56

DESIGN DATA

Watershed Area, A = 650 acres Length, L = 2000 feet

Width, W = [a] 550 or 3580 = 2994 ft L/W = 2.6

[a] 6000

Average Slope = 6 % Runoff = 12

Typical Soils Evenside-Chester Infiltration = 10

Portion in good cover _____ % Cover = 10

S. Storage = 10

a w = 42

P = 5.76 F = .83 R = 1.0 S = .79

Q = ___ = P x F x R x S = 377 c.f.s.

Spillway bottom width = 100 feet Slope = 1.5 feet

Slope of exit section = _____ % Side Slopes 3:1

GENERAL INFORMATION

Uses for impounded water Irrigation & Recreation

Area at normal Pool = 20 Acres Maximum depth = 26 feet

Capacity = "Gc" = 20 ac. x 26 feet = 312 acre feet

EARTH QUANTITIES

Embankment	22497	cu. yds.
Excavation of Cutoff Trench	3576	cu. yds.
Excavation of ~~Fill Trench~~	534	cu. yds.
Other Excavation		cu. yds.
Total	26,607	cu. yds.

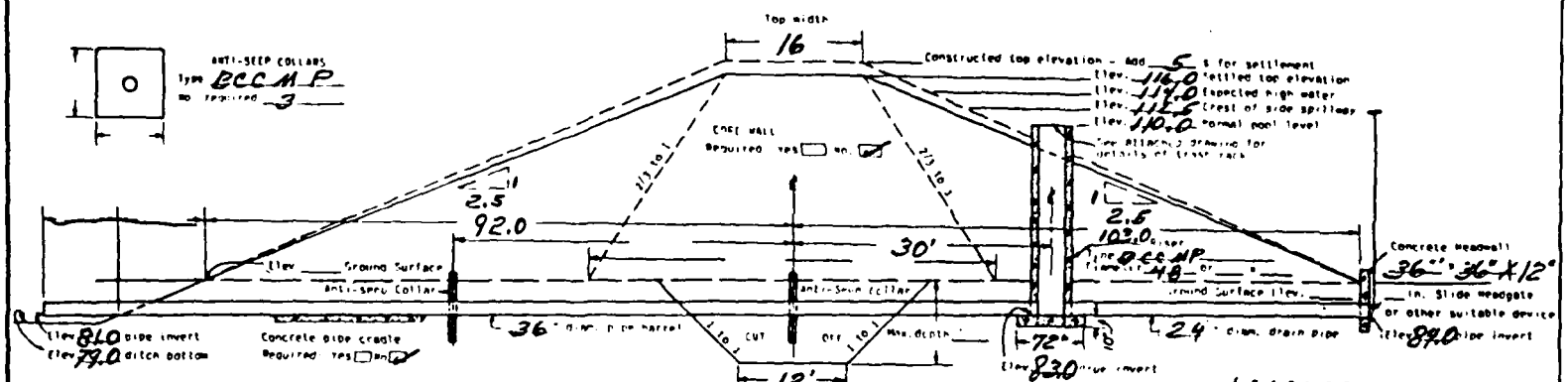
BENCH MARK DESCRIPTION

Nail in large Ash tree at bridge on left of road to barn Assumed Elev 100.00

BILL OF MATERIALS

26607 Cu yds. of earth moving
27' of 48" bituminous Coated Corrugated Steel Pipe
122' of 36" " " " "
73 of 24" " " " "
1.5 Cu yds. Concrete
67 Tons Crusher run stone
One Slide Headgate
One trash rack
53' of 6" PCC MP
62' of 6" PCC MP
324' of 6" Perforated PCC MP

Note: Include necessary grass seed, lime, fertilizer, fencing material, stock tank etc. where applicable



Cove will be excavated to depth satisfactory To owners representative

SECTION THROUGH FILL ALONG CONDUIT
STATION 3+35 ON CENTERLINE

(FARMER'S COPY)

PLAN OF FARM POND
Precision Dynamics Farm
Loudoun County, Virginia

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P.P. Hughes [illegible]
P.P. Hughes [illegible]

CERTIFICATION

I certify that I have made, or caused to be made, a final inspection of this pond project and that all work related thereto has been completed in accordance with these plans and with all other applicable specifications except as listed on the attached sheet.

(Check here ☐ if no exceptions)

Signed _____ Title _____ Date _____

PLATE 2

APPENDIX II

PHOTOGRAPHS

Photograph No. 1 - Upstream Face of Dam
(Note worn cattle paths)

Photograph No. 2 - Downstream Face of Dam

Photograph No. 3 - Intake Structure

Photograph No. 4 - Outlet Pipe

Photograph No. 5 - Plunge Pool

Photograph No. 6 - Toe Drain at Outlet Pipe (Arrow)

Photograph No. 7 - Downstream Area
(Arrow indicates Sleeter Lake)

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam Precision Dynamics County Loudon State Virginia Coordinates Lat 39° 06.7' Long 77° 45.9'

Date(s) Inspection May 4, 1981 Weather Clear-Sunny Temperature 75°F

Pool Elevation at Time of Inspection 535 msl Tailwater at Time of Inspection 499 msl

Inspection Personnel:

Schnabel Engineering Associates, P.C.
Gilbert T. Seese
Stephen G. Werner
Raymond A. DeStephen, P.E.*

J. K. Timmons and Associates, Inc.
Robert G. Roop, P.E.
Steve Oddi

State Water Control Board
Hugh M. Gildea P.E.

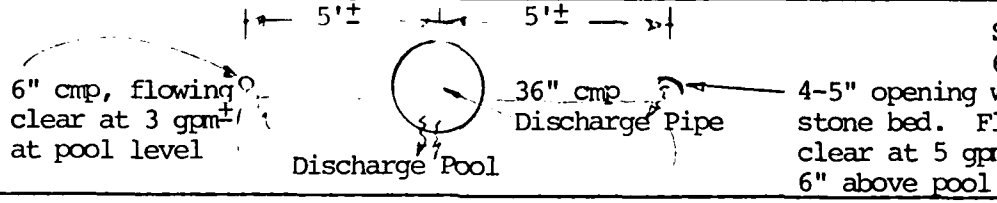
Gilbert T. Seese, Recorder

* Not present during 5-4-81 inspection but visited the dam on 6-15-81.

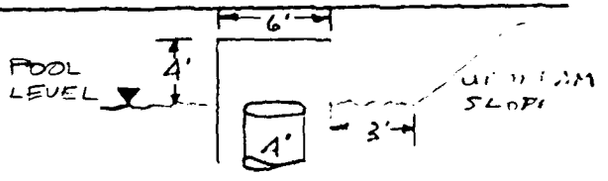
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	The slopes, crest and abutment contacts were inspected and no cracks were noted. Ground conditions were dry.	-
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No unusual movements were noted on the dam or beyond the downsteam toe.	-
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Several animal burrows on the downstream slope - one (12" dia.$\pm$) 5 - 7 ft above the discharge pipe on the right side. Slight erosion noted around the discharge pipe. Four cattle paths along the downstream slope 5 ft$\pm$, 10 ft$\pm$, 15 ft$\pm$ and 20 ft$\pm$ above the top of the discharge pipe. Numerous catte paths and associated erosion exist on the upstream slope. Some sloughing of upstream slope in line with intake structure noted.	See Field Sketch
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	The vertical and horizontal alignment of the dam appeared to be good.	-
RIPRAP FAILURES	No riprap was observed except below pool level. The riprap appeared to be intact and in good condition.	-

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	The embankment ties in properly with the abutments. The contacts are well vegetated and in good condition. No erosion was noted. Right abutment consists of fine to coarse silty sand, with gravel and boulders, dry - brown (SM)	-
ANY NOTICEABLE SEEPAGE	Along the left downstream toe the ground is somewhat spongy and includes scattered marsh grass. This area extends to a point 8 ft above the discharge pool along the left abutment - embankment contact. Marshy conditions also exist 135 ft± downstream on the right side of the stream.	See Field Sketch
DRAINS		Similar flows observed on 6-15-81
MATERIALS	Fine to coarse silty clayey sand, with gravel and boulders up to 2½ ft in length (SC) to fine to coarse silty sand with gravel and boulders (SM). Some scattered brown silty clay, trace fine sand (CL) also present.	-
VEGETATION	Downstream slope grassed and well maintained. Two small hardwoods and one large brier bush present on left downstream slope. Less grass on upstream slope, but vegetation is well maintained.	Trees should be removed, upstream slope should be reseeded.

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONTROL SECTIONS	The principal spillway consists of a 48" CM riser pipe with a 72" trash rack. In good condition.	
APPROACH CHANNEL	None	-
DISCHARGE CHANNEL	There is a 36" CM bituminous coated discharge pipe which flows into a plunge pool with no riprap. The discharge channelis a 3' wide stream at 3" flow depth N = 0.07, Overbank N = 0.05	Some erosion noted.
BRIDGE AND PIERS	None	-
EMERGENCY GATE	None visible	-
GATES AND OPERATION	None visible	-

EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	There is an emergency spillway located at the right end of the dam. The control section is 80 ft long and is 3½ ft above pool level. There is a gravel road through it. Good vegetation and no erosion. 3H:1V side slopes.	-
APPROACH CHANNEL	Grassed; pasture	No erosion
DISCHARGE CHANNEL	Grassed; pasture	No erosion
BRIDGE AND PIERS	None	-
MISCELLANEOUS	None	-

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
MONUMENTATION/SURVEYS	None observed	-
OBSERVATION WELLS	None observed	-
WEIRS	None observed	-
PIEZOMETERS	None observed	-
STAFFGAGES	None observed	Should be installed
OTHER		-

RESERVOIR

VISUAL EXAMINATION	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SLOPES	For the most part gentle grassed slopes (20H:1V) or pasture, bound the reservoir except along the extreme upper end where the property is open wooded. There is no erosion along the shoreline. The reservoir was free of debris.	Shoreline appears stable
SEDIMENTATION	No sedimentation apparent, clear water.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Small meandering channel with scattered tree debris laying in it. The channel is 4 ft± wide, is tree lined and meanders through pasture.	N = 0.05 channel and overbank
SLOPES	Gentle (20H:1V) to moderate grassed slopes with scattered trees.	-
APPROXIMATE NO. OF HOMES AND POPULATION	None, empties into Sleeter Lake ⅛ mile± downstream. Several homes downstream of Sleeter Lake at ⅛ mile± and 4 miles±.	Failure could cause overtopping of Sleeter Lake Dam

CHECK LIST

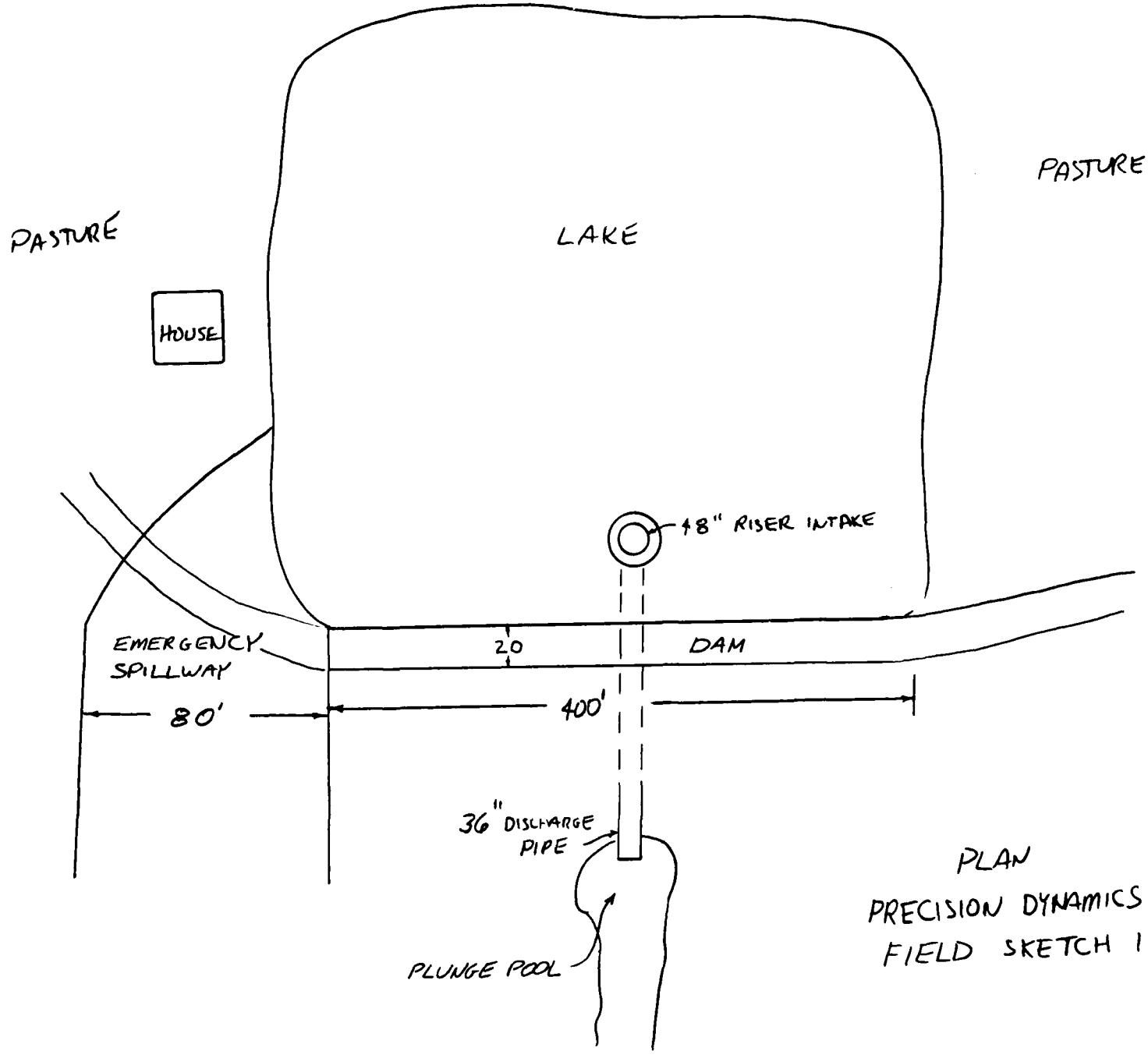
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION

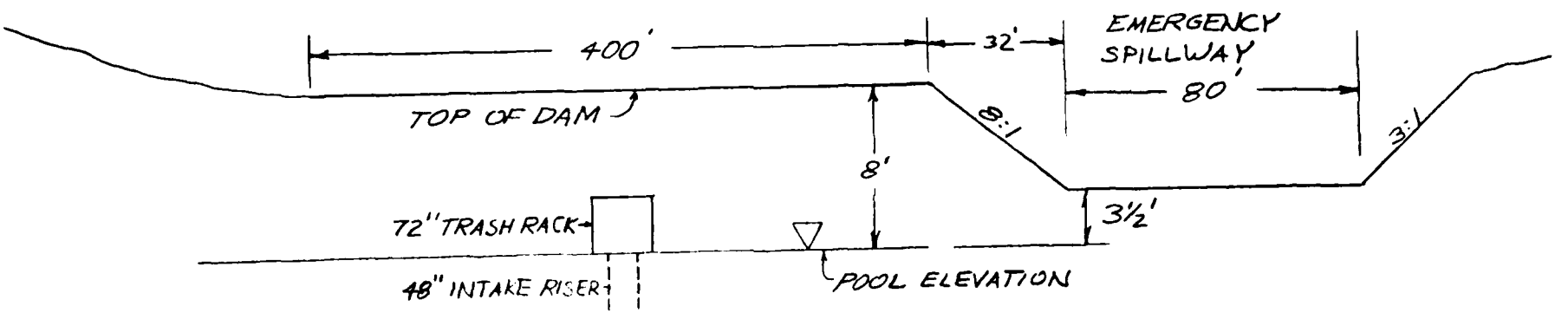
ITEM		REMARKS
REGIONAL VICINITY MAP	Bluemont Quadrangle, U.S.G.S. 7½ minute topographic map	-
DESIGN/CONSTRUCTION HISTORY	The dam was designed by USDA SCS in accordance with their farm pond criteria. The dam was constructed by L. B. Mason, of Hamilton, Virginia and completed in 1967.	-
PLAN OF DAM	See Plate No. 2, Appendix I	-
TYPICAL SECTIONS OF DAM	See Plate No. 2, Appendix I	-
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	See Plate No. 2, Appendix I	-
SPILLWAY- PLAN SECTION DETAILS	See Plate No. 2, Appendix I	-
OPERATING EQUIPMENT - PLAN DETAILS	See Plate No. 2, Appendix I	-

ITEM	REMARKS	
MONITORING SYSTEMS	None	-
RAINFALL/RESERVOIR HIGHPOOL RECORDS	None	-
GEOLOGY REPORTS	Geologic Investigation of the Lincoln and Bluemont Quadrangles, Virginia, Virginia Division of Mineral Resources, RI # 14	-
BORROW SOURCES	Reservoir area and emergency spillway; Worsham and Eubanks-Chester soils used in construction	-
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY-FIELD TEST DATA	None	-
HYDROLOGIC/HYDRAULIC DATA	None	-

ITEM		REMARKS
DESIGN REPORTS	None	Data on file at Loudoun County SCS Office
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None	—
POST CONSTRUCTION ENGINEERING STUDIES RECORDS, SURVEYS	None	—
MODIFICATIONS	Field measurements (crest = 20 ft, upstream slope = 3H:1V) are slightly different than shown in design (crest = 16 ft, upstream slope = 2.5H:1V)	—
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown	—
MAINTENANCE OPERATION RECORDS	None	—

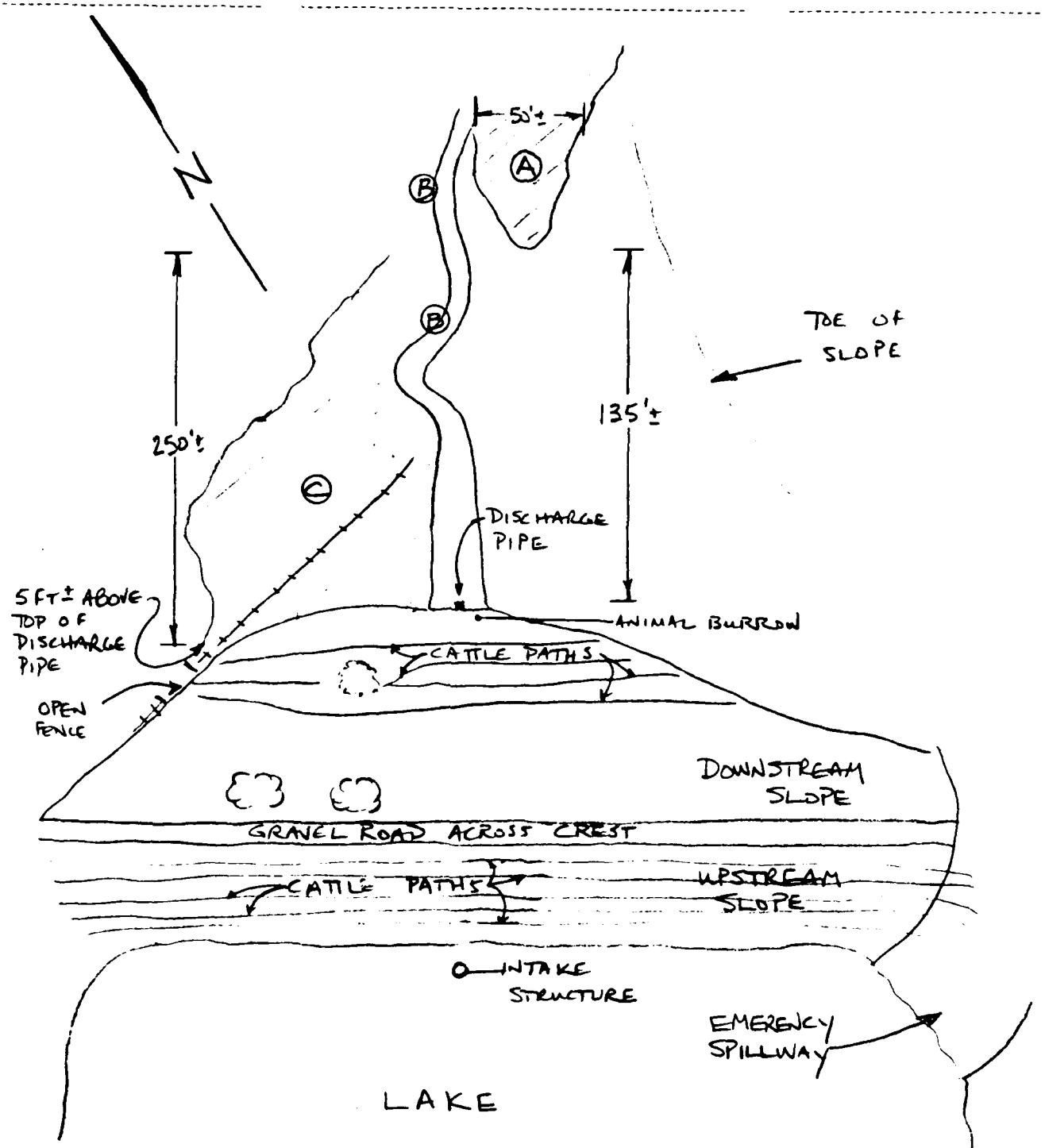


PLAN
PRECISION DYNAMICS I
FIELD SKETCH 1
4 MAY '83



PROFILE
FIELD SKETCH 2
PRECISION DYNAMICS
4 MAY 1981

BY SVV DATE 2-9-21 SUBJECT FIELD SKETCH SHEET NO. ... OF ...
CHKD. BY ... DATE ... PRECISION DYNAMICS DAM JOB NO. ...



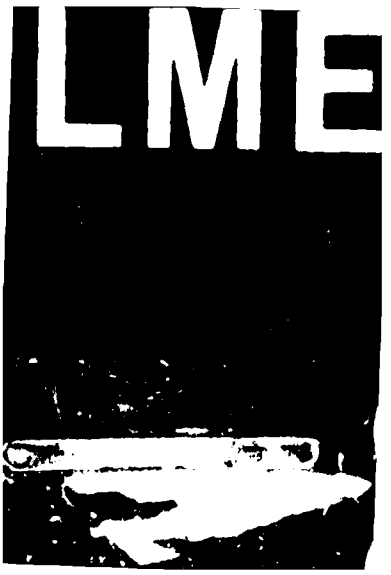
(A) SCATTERED MARSH GRASS AND SATURATED GROUND; EXTENDS SEVERAL 100' DOWNSTREAM. SOUTH END OF AREA IS 5 FT ABOVE TOP OF DISCHARGE PIPE. NO FLOW OBSERVED.

(B) SCATTERED IRON STAINING ALONG BOTH SIDES OF STREAM NO FLOW OBSERVED.

(C) MARSHY AREA WITH CATTAILS OCCUPYING THE UPPER 75'± OF THE AREA. GROUND IS SATURATED. SCATTERED IRON STAINS AND FILMS ON STANDING WATER NOTICED. NO FLOW OBSERVED.

APPENDIX IV - REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Department of Army, Office of the Chief of Engineers, 46 pp.
2. Design of Small Dams, U. S. Department of Interior, Bureau of Reclamation, 1974, 816 pp.
3. Geologic Investigation of The Lincoln and Bluemont Quadrangles Virginia, by P. E. Parker, Virginia Division of Mineral Resources, Reports of Investigation No. 14, 23 pp.
4. Soil Survey, Loudon County, Virginia, U. S. Department of Agriculture, Soil Conservation Service, 1960, 118 pp.
5. HEC - 1 Dam Break Version, Flood Hydrograph Package, Users Manual for Dam Safety Investigations, the Hydrologic Engineering Center, U. S. Army Corps of Engineers, September, 1978.
6. Hydrometerologic Report No. 33, U. S. Department of Commerce, Weather Bureau, U. S. Department of Army, Corps of Engineers, Washington, D. C., April 1956.
7. Technical Paper No. 40, U. S. Department of Commerce, Weather Bureau, Washington, D. C., May 1961.


LME